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Subject: RE: Bayou Corne Science Workgroup Update
Date: Friday, April 25, 2014 2:25:00 PM

Sorry for the delay I was out of town for a week. As discussed at our last conference call, the frequency of our call will be quarterly from now on with monthly update email (sent around mid-month). **Our next call will be held on May 14th at 2:00 pm** unless condition changes at Bayou Corne requires an earlier one. Below, please find this month update provided by CBI and Prof. Horton. The April 2014 material can be accessed by copying and pasting the following link into your web browser: <ftp://bcsbw.BayouCorne14@ftp.dnr.louisiana.gov>

Thomas

Current Status/Updates April 25, 2014

1. Current Status/Updates

A letter was submitted by TBC on March 21, 2014 requesting a reduction in the monitoring frequency for numerous activities at the site including groundwater monitoring, pressure monitoring, sinkhole profile sampling, and bubble site monitoring. The LDNR approved some of the requests for reduced monitoring frequencies (in correspondence dated 4/1/14) pending approval of some of the proposed changes in a work plan.

a. Bubbling Locations/ Intensity Changes

- Currently on a monthly monitoring frequency. Proposed changing frequency to monthly for sites in the community and quarterly for remainder of the sites (pending approval of a work plan).
 - Two new bubble sites (104 and 105) of low intensity identified since last update.
- Site 104 is a low intensity site located in a canal approximately 4 miles north-northeast of the sinkhole.

- Site 105 is a low intensity site located in Grand Bayou about 3,000 ft SW of the sinkhole.
- Previously identified site 101 (located above horizontal pipeline boring beneath Grand Bayou about 4,600 ft NE of the sinkhole) stopped bubbling on 3/19/14. Gas analyses indicate this location was biogenic gas.
- In process of reviewing bubble intensity data from the 1/1-3/14 event. Will complete review for next update. There were some changes observed in the bubble sites to the southwest and west of the sinkhole as a result of the new berm construction in these areas.

b. Sink Hole Changes

- The last sinkhole depth survey by Miller Engineering was conducted on 3/18/14 indicated max 248 ft (wireline tag) and 227 ft (fathometer). Sinkhole elevation cross-sections indicate similar configuration to previous survey with some deepening in the central portion of the sinkhole. Miller updated the sinkhole volumes. Miller estimates of sinkhole volume based on -10 ft contour and below is 3,007,493 cubic yards (previous 3,035,532 cubic yards) with area of 29.4 acres (same as previous). Volume based on -10 ft to -2 ft contour is 111,952 cubic yards (previous 104,500 cubic yards) with area of 23+ acres (same as previous). The total area of the sinkhole and surrounding area from -2 ft contour and below is 52.4 acres (same as previous).
- March 24 – there was a VLP event and the sinkhole lost a significant amount of water.
March 26 – there was a VLP event and a slough-in on the eastern side of the sinkhole, north of Pad 3.
March 31 – there was a slough-in at Pad 3.
- South berm is being rerouted farther south. Still surveying points on original south berm. Survey data indicates a total subsidence in central portion of southern berm of about 4 ft (similar to previous update). Additional survey data of berms from 3/24/14 shows continued subsidence along the north, west and south berm. Subsidence is most pronounced on berm southwest of the sinkhole on the order of 9.97 to 16.61 inches (previous 9.5 to 15.95 inches) since June/July 2013. Western portion of the north berm is also continuing to subside with max subsidence of about 4.5 inches since June/July 2013.
- Surface water outside the berm was allowed to flow into sinkhole recently to adjust surface water to higher levels inside the bermed area.
- Last sinkhole depth profile sampling was conducted on 3/19/14. Changing sampling frequency from monthly to quarterly.

c. Observed Seismic Activity

- The seismic alert level for the Bayou Corne sink hole has been code 1, green indicating a low level of observed MEQ and VLP activity for all but two days during the last month. On 03/24/2014 the Oxy 3 cavern pressure was bled down in the morning. A couple of hours later an intense episode of MEQ activity (~90 events) combined with large VLP events occurred. The seismic alert level was increased to code 3, green at that time. The seismic activity significantly decreased overnight with no VLP events, and the seismic alert status

was decreased to code 2, green the next day. The following day the seismic alert status was decreased to code 1, green and it has since remained at that level. We continue to have a few very small MEQs on a daily basis, but very little VLP activity.

d. Aquifer Relief/Vent Wells, Monitoring Wells, Geophone wells and Geoprobes

- **Relief Wells**

As of 4/7/14, approx. 15 wells flaring out of 47 total active wells

(Well ORW-5, 7, 8, and 12 have been plugged and abandoned)

Combined flow rate of approx. 73.1 mcf/d (previous 44.7 mcf/d) with a cumulative total flared of approx. 27.4 mmcf (previous 25.9 mmcf).

Community ORW Pressures and Gas Flow Rates as of 3/10/14

North of Hwy 70:

ORW-21 pressure NA psi, shut-in

ORW-38 pressure 0 psi, flowing, total flowed 1 mcf (previous 1 mcf)

South of Hwy 70:

ORW-36 pressure 46 psi, flowing at 10.34 mcf/d, total flowed 2,686 mcf (previous 2,407)

ORW-37 pressure 3 psi, Shut-in, total flowed 249 mcf (previous 249)

ORW-49 pressure 33 psi, flowing at 1.59 mcf/d, total flowed 471.2 mcf (previous 420 mcf)

ORW-50 pressure 45 psi, flowing at 6.26 mcf/d, total flowed 1,143 mcf (previous 962)

- **Shallow Geoprobe Wells**

18 one-inch diameter shallow (30 to 50 feet depth) monitor wells continue to be monitored every other week for wellhead pressures, water levels, and % methane weekly. Changing monitoring frequency to monthly schedule.

Wellhead Pressure Data - Most recent data from 4/3/14 indicates 4 of the 18 locations were showing pressure ranging from 6 to 14 psi.

Formation Pressure Data - Formation pressures have remained relatively stable since the last update, typically measuring around 10 to 16 psi at most well locations.

TBC installed shallow wells (GP-1 through GP-6) showing pressure in one of the four wells

measured at a pressure of 4 psi. Formation pressures are relatively stable, typically in the range of 8 to 12 psi.

- **Monitoring Wells (Industrial water wells and MRAA wells)**

- Industrial Water Wells**

- Most recent report issued by Pisani dated Feb 10, 2014 – Provide potentiometric figures and analytical data for the industrial water wells and MRAA wells.

- MRAA Monitor Wells**

- Most recent report issued by Pisani dated Feb 10, 2014 – Provide potentiometric figures and analytical data for the industrial water wells and MRAA wells. Monitoring frequency changing from monthly to quarterly for some wells.

CB&I is currently splitting 10% of the wells sampled by Pisani.

- **Geophone 1 Well**

Nothing new since last update.

- **Passive Vent Wells**

All the PVWs have been plugged and abandoned.

e. Testing/Data Collection on OXY #3 Cavern

- Maximum tool depth measurements

Summary of previous “maximum tool depth” tags below.

<u>Date</u>	<u>TVD (ft)</u>	<u>Change from Previous (ft)</u>
2/28/14	3415	2
3/14/14	3766	-351
3/28/14	3732	34
4/11/14	3550	182

- Solids interface (where the brine stops and the more dense fluid material begins) as determined by gamma-ray and density logs.

Summary of Solids interface

<u>Date</u>	<u>TVD (ft)</u>	<u>Change from Previous (ft)</u>
2/28/14	3404	?
3/14/14	3431	-27
3/28/14	2500-2920	Flushed tubing with fresh water after flowing
4/11/14	3410	21 (since 3/14/14/ tag)

- TBC flowed Oxy 3A well as follows:

March 24 – flowed 260 bbls from Oxy 3A

March 26 – flowed 323 bbls from Oxy 3A

March 31 – flowed 870 bbls from Oxy 3A

April 1 – flowed 201 bbls from Oxy 3A

April 2 – flowed 585 bbls from Oxy 3A

- CB&I collected sample of higher density flowed-material for analysis.
- As of 4/7/14, the casing pressure was 421 psi and the tubing pressure was 980. The tubing was filled with freshwater following the flowing activities.

f. Subslab monitoring

- Performing daily inspections and necessary maintenance on the under-slab vent systems. No other new information reviewed since last call

g. Subsidence monitoring

- RESPEC issued a Semiannual Subsidence Data Analysis report late last week.
- Additional subsidence monitoring network stations are being installed but the current status of this work is not known.

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